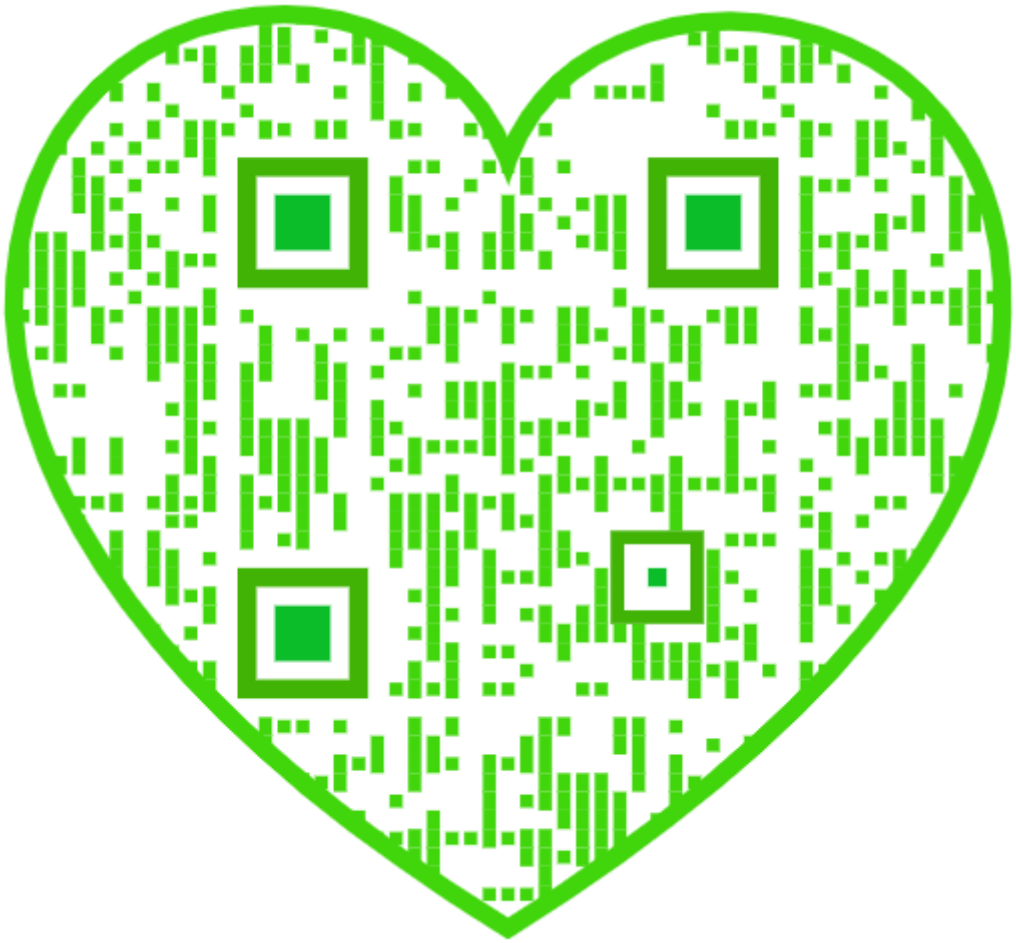


INDIAN CORN

MASSACHUSETTS
AGRICULTURAL
COLLEGE

BY

HON. M. W. DAVIS, of Westminster,

Member of the Board of Agriculture.

MONTPELIER:
VERMONT WATCHMAN & STATE JOURNAL PRESS.
1886.

633.13
D29

INDIAN CORN.

By Hon. M. W. Davis, of Westminster, Member of the Board of Agriculture.

This is no new theme, not a new plant introduced into this country of ours for experiment. For hundreds of years it has been known to our people, and for centuries to the people of Peru, South America. The colonist at Jamestown and Plymouth found the natives successfully cultivating it. I believe it is indigenous to America having been found in the vicinity of the Rocky mountains in later time in its original type, when every kernel or berry of its fruit was enclosed in a separate clothing of husk, which, from cultivation, has been thrown off. Now, you and I have cultivated this plant for more than forty years, annually raising a crop. We have, as we thought, carefully traced up the seed, talked of the wholesome corn bread, enjoyed in past time the corn husking, etc., so much so that it would seem at first we had a full and complete knowledge of all that pertained to it. But I fear when we come to give thought to the matter there is very much we may learn that will be useful and interesting to us. I am free to admit myself that my own knowledge must, to you, at every step I take here, seem limited while attempting to unsolve its mysteries. But I am incited to new developments, not altogether in the study of its botanical structure and natural history, but its usefulness and as a necessity with an increased cultivation in a wise ordered agriculture in Vermont. Not only would I try to infuse new light and interest mingled with intelligence among the active farmers of my state, but to interest them in the cultivation of this farm crop in priority to any other upon the farm, except grass, and during a few years past of drouth, it may be said to be "king." But I would at the same time try to interest the boy who holds the cultivator, or the girl who shells papa's seed corn, or husks to find the variegated ear, how the plant grows, that increasing knowledge may be united with their labor, that irksomeness be obliterated so far, in farm life. Indian corn has great flexibility of character, adapting itself to a great variety of soils and climate, indigenous to no arbitrary time or latitude, ranging through some seven degrees isothermal in its northerly line westward. In New Brunswick 46 ° north, 45 ° in Maine, 44 ° in New Hampshire, 47 ° in Quebec, descending again in New York and Canada West to 46 °, and when the line approaches the cooling influences of the lakes drops to 45 ° until almost to Minnesota. On reaching Lake Winnipeg ascends to 50 °, and sometimes 51 °, the most northern limit of its cultivation on this continent. This line terminates abruptly on the 120 ° longitude, west of which it cannot be raised, and must have a mean temperature of 65 ° above zero at least two and a half months of each year, while in latitudes

of a much higher temperature, it adapts itself readily. While there is but a single species of Indian corn as I have described the original, all the multitudinous varieties in size, shape and color, from the smallest pop corn with a tiny ear, not more than two inches long, eight rowed, and stalks of two feet in length, to the thirty-six rowed ears fifteen inches long, having more than six hundred kernels, with stalks twenty feet high, requiring periods of growth ranging from sixty days to two hundred. With us about one hundred days with medium variety properly adapted. There is a great diversity in the internal and external structure of the kernels. Some are smooth, with an enamel of thick, flinty substance, sometimes known as Flint corn; then there are others with an indentation, long, flat kernel, grown extensively in the West and South, known as "Dent" corn. Some kernels grow deep upon the cob, and some shallow. Then the internal structure varies in composition, some varieties possessing a large amount of oil and less starch, and others *vice versa*, varying widely in the amounts of gluten, dextrine and phosphate. At a glance we see this wonderful diversity as we bring side by side the little ear of pop corn, white, yellow, red, smooth kernel or bearded, the "flint" white, red or yellow, eight rowed to ten or twelve, and the "dent" white, red and yellow, from twenty to thirty-six rowed, with now and then a variegated colored ear from each variety, we exclaim, wonderful! What! all from one variety? That little native corn plant producing fruit so susceptible of change, almost losing its original identity. Now the characteristics of each variety evidently mark the market value for feeding purposes or manufacturing. The man who knows the characteristics of his animals knows how to feed them, instead of running in the old rut, believing corn is corn and a cow is a cow.

I now come to the inquiry which you are making, and of the most importance to you and me (though I will hint at the auxiliaries so as to have an intelligent system), and that inquiry embraces soil and climate, as well as system.

WHAT SOIL?

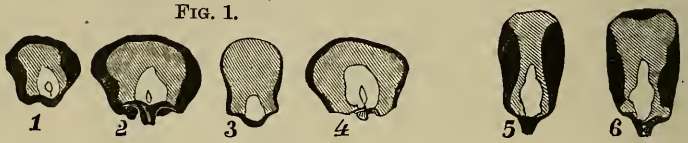
You have answered this question mentally before I write it. A light, warm soil, inclined to East and South, rich in phosphates and potash; and maximum crops cannot be raised profitably on land of opposite character or deficient in them. I say raise corn on "corn land." But says one, "I have but one piece upon my farm adapted to corn;" if so, keep corn upon it. I care not if for forty years it will require but a small amount of manure annually to keep up the productiveness of that soil; if the farm has not even that piece don't raise any, for the presumption is that it is a grass farm, and had probably better be devoted largely, if not exclusively, to that crop. Corn must have a right climate, though, as I have stated, it can be raised as far north as 51°, but only in small quantities. It is a tropical plant, likes light and heat, even moisture, though it will stand drouth remarkably. I say it demands heat. It cannot be matured in England, although the mean temperature is above New Hampshire. It

has been found far up among the mountains of the Alps, because there it receives the shelter of the mountains, and the hot rays of the sun are reflected upon it, keeping the temperature high. Although we may have the soil and climate, it must have culture, and this means a certain method of manipulation and fertilization. This brings me to Nature's God where we may briefly study his unerring laws, and by the aid of these drawings taken by the artistic hand during the stages of its growth, I hope to interest the children in attempting to tell

HOW CORN GROWS.

Now a kernel of corn is a very small thing, but in corn raising it is important, an absolute necessity. When the school-teacher gave the question to three little boys, "For what use is Indian corn most important?" after due deliberation one hand went up, "To grind into meal to feed the horse;" then another hand, "To make into bread;" then a third hand, "To plant." That is it, and it should be perfectly adapted to the location and situation; if it be imperfect we may expect many imperfect plants, evidently deteriorating the crop. If with a sharp knife the side of the kernel is removed, by a little magnifying glass can be seen the proportion of oily and starchy substances. Each variety contains:

FIG. 1.



No. 1, Pop corn; No. 2, King Philip; No. 3, Mexican; No. 4, Tuscarora; No. 5, Shoe-peg; No. 6, Improved Gourd-Seed Corn.

The next steps are well shown in Dr. Cutting's work on Plant Growth, and I reproduce the cuts there used.

FIG. 2.

INDIAN CORN.
A sprouted—B where stalk is two inches high.

Fig. 2. At A, the corn is represented as just sprouted, the plumule, or stalk, tending upward and the tap root directly downward. In a few hours after sprouting, little rootlets extend from the end of the kernel that aid in the rapid growth of the young plant, and in developing the first tier of sucker roots, which are sent out a few days later. The kernel with its rootlets thus attached may be seen at B. A few days later the roots assume the appearance seen in Fig. 3, when the stalk is about five inches high.

FIG. 3.

Corn roots at a growth of five inches of stalk.

This shows that when we plant a kernel of corn we set out an organized plant, containing all the phenomena to perfect fruitage, in embryo, as much as when the nurseryman removes a tree from the nursery. In planting a kernel of corn in the soil the shelly covering that has protected the cotyledon, or grain, is moistened and softened under the solar heat and rain. The plumule springs upward through the soil, and the radical starts downward, feeding for days upon the kernel until exhausted of its plant food that nature so wisely provided, ready and at hand for its weak and infantile existence, and

then upon other supplies adapted and furnished for its further and continual development. As the chick in the egg, containing all the elements of the full fledged bird, breaks forth into existence and subsists for hours and days, with an increased development, without artificial food, so the corn plant, after exhausting nature's supply from the seed deposit, has in preparation a power, constantly adding numberless roots spongioles, each terminating with a little hard substance at their point, back of which are mouths, so to speak, to drink in food, as they travel in the soil, the plumule or stalks correspondingly developing the leaves or lungs to inhale and exhale the requisite constituents beneficial and injurious to its maximum developments. So if we observe its laws of expansion, noticing the necessity of warm showers, solar heat and proper fertilization, much of the latter rendered available by thorough cultivation and manipulation of the soil, aided in the chemistry of nature.

Fig. 4.

We see in Fig. 4 the stalk divided into spaces some six inches apart, joints or nodes, with long graceful leaves growing out upon opposite sides, with a hand or clasp at each of these points to give it strength.

Fig. 5.

And in Fig. 5 at the time silk has formed, we see developed at the axle of each leaf on the lower half of the stalk a tiny ear, the uppermost being the more advanced in development, to the number of half a dozen or more, always upon the concave side. These hollows are to accommodate the reception of the ear; the continuance of this concavity and the multiplicity of the nodes shows the willingness of

nature to produce an ear at each of these interstices, and if we could secure this full development of nature, how wonderfully we could increase our harvest—even five or six-fold. And here is the possibility that is afforded to the farmer in raising an increased crop. Now seldom only the upper ear perfects under ordinary culture, though at times two, three, and more are quite well developed, showing that here is a study of nature's demand overlooked by the common farmer, which, if heeded, easily could double and treble his ordinary crop.

Fig. 6.

Fig. 6. The leaves have been removed to show the incipient ears and their location, of which I have just been speaking.

Soon after the stalk has reached its full height, the stamens, or tassel, appear; the pistils or silks also are seen protruding from the point of each ear, and they are attached to each little cell upon the cob to perfect the kernel, first forming at the base of the ear and continuing upward until finished by the last kernel

Fig. 7.

upon the top of the ear, as seen in Fig. 7. During all this time the stamens are showering down the pollen upon the pistils or silks to fertilize or fructify by induction. By this it seems to me is shown the fallacy recommended by some to remove the suckers, as I believe them an absolute necessity to produce pollen to the last moment needed for perfect fertilization. The boy with his cultivator, horse and harness, will remember how they were covered with yellow dust. Well, that was the life-giving principle to the perfection of the ear; for if the connection be cut off or hindered no kernels upon the ear, but vacant cells, is the result. If the boy should tie a piece of paper over the little germ of an ear so none of the pollen could fall upon it, he would see the truth of my remark; or if he will observe a stalk of corn, far removed or isolated from any other in the potato or grain field, with no other pollen but its own to supply, and that subjected to the wind, carrying much of it beyond and out of reach of its own benefit, and he will find the ear upon that stalk but partially, if at all, furnished with kernels. This speaks volumes of unwritten, yea, hidden mysteries concerning this mysterious plant. These are some of the phenomena one meets in observing the botanical and physical growth of a stalk of Indian corn; the awakening of the dry kernel to life, putting forth the stalk and root; their gradual development, the tiny ear, the flowering of the plant, fertilization of its growing seed—all would seem to me to give the observant youth, the young man or boy, the lady or girl, a beautiful theme for study; removing the tiresomeness of labor of the farm boy in its cultivation, or the daughter (when she beholds the full-grown corn field standing erect with its leaves fluttering in the wind, resembling as one has said "so many knight errants with their handkerchiefs held to the breeze"), to cheer her in her domestic duties, it would seem with an increased love and ardor for the farm. Now I have specially made a few suggestions upon my themes for the benefit of the young that I might suggest one factor in life's work upon the farm that could bring pleasure, that it might afford means to aid in increasing a higher estimate of farm life. A "step-stone" to observation, if heeded, mingled with thought make many students of nature, drawing them nearer to "Nature's God." But there is another line of thought yet, after all, but following out the line spoken of and suggestive, the goal of which is, How shall we raise maximum crops? Allusion to climate and soil has been made. Now I would have the Vermont farmer attain the ideal perfect Indian corn crop, aiming for the top round and realizing approved results. To this end I would allude to some of the reputed crops of New England that we may not fix the standard below. When the Board of Agriculture convened at Westminster, while Prof. Collier was secretary, a farmer of that place stated he believed it possible to raise one hundred bushels of corn to the acre. The professor astonished, said he wished he could live to see that day, just as if thereby his life would be prolonged beyond three score years and ten. But in that meeting it was stated in two instances that in the month of October, by a disinterested committee to harvest and report for competition at the fair, 115 and 131 bushels to the acre, in good condition

for the time of the year to crib, had been produced in that very town; but the exception by the professor was it would shrink far below the 100 bushels when merchantable, or in the spring following. Since we have numerous reports of crops that exceed that. In 1881 upon the "Long Island farm," the editor of the *New York Rural* on four acres raised 113.69 bushels per acre, and on one acre 159.37 bushels. The variety was "Chester County Mammoth." Another acre of the "Blount" variety upon the same farm yielded 134.44 bushels. E. A. Bowditch of Framingham, Mass., on one and one half acres obtained an average of 109.25 bushels per acre. At Manchester, Vt., a boy who sought for the prize in corn raising offered by the Burlington College, produced 127 bushels at harvest time per acre. Now less than 36 bushels to the acre upon an average is raised upon the Vermont farms, producing about half of what we consume; the remainder bought by money going out of the state, out of the pockets of the farmers. This in view, with the possibility that has and can be attained, ought to arouse and stimulate the farmer to engage more extensively in corn raising, not only in larger quantities to the acre, but increased acreage.

"But what system?" I have said corn must be raised on corn land, and by the use of machinery to lessen the expense. To this end make the piece for corn one piece, if practicable, and of such form that the rows may be as long as possible, for it takes the horse as long to turn around at the end of ten rods as at the end of forty rods. Now when the piece is selected there is back of all this as the foundation of success, the necessity of keeping in mind the future fertility of the soil, that in a system of rotation certain crops store up without expense constituents adapted to grow maximum corn crops; and one of the most essential is a clover crop, leaving the soil in the very best mechanical condition at the same time. In the abundance of its decomposing roots the soil is charged with nitrogen, phosphoric acid and potash, all necessary food for the corn plant. I find no condition of the soil so adapted to a corn crop as an inverted clover sod well prepared, and here is an important factor in the system—*good plowing.* I care not how narrow the furrows, but that every inch of the ground should be turned, the depth should vary as regards soil, and the amount of manure to be used, usually from five to seven inches deep for most soils. No arbitrary rule can be used. Next is thorough pulverization, a very important element in the work; a seed bed the air can penetrate, a soil made fine, unlocking plant food ready to be used as the corn roots in their rapid growth, need it. To raise this increased production most, if not all soils require an additional supply of proper fertilizer. What this is, and the amount and application is the desired information. A few years ago the farmer, wishing to enlarge his crop, and being baffled by his ignorance, the chemist stepped in and told him to send a sample of the soil he wished to plant to corn to him and he would tell him what it contained and wherein it was deficient in the requisite constituents to properly feed his crop of corn, but the chemist did not tell him what was available plant food, or could economically be rendered so by the farmer in due season for his crop.

The soils of his own little farm, even, were so varied in their geological formation that the laboratory unfolded insufficient help. Then another view by the chemist was offered the farmer by Prof. Stockbridge, saying, "I have analyzed this corn plant, dissected it of its parts, and have prepared a compound, a fertilizer giving you the amount requisite to produce forty or fifty bushels to the acre, as you desire, only varying in quantity, and exacting *pro rata* equivalent for your money. This method of fertilization far exceeded the first, yet was impracticable, for while the professor furnished a perfect corn fertilizer, he did not know how many elements in the farmer's soil were already there in abundance, which he proposed to furnish at the farmer's expense; besides, overfertilizing with many constituents, if furnished and applied was injurious, although this system was in many respects meritorious yet impracticable. It left the farmer no other alternative except the study of his own soil for this crop or any other by plot fertilization, finding what is needed outside of his farm manures well husbanded and applied, and using those only required to give him a desired crop. The same experimentation is commendable, and as a rule is growing in favor among the best farmers; also, to apply all manures in the fall or winter, to take advantage of the moisture, and not apply in late spring or summer, to be followed with the dry seasons, that we seem to be doomed to experience, when there is not moisture enough to dissolve the fertilizers, making soluble food in season for the plant's necessities.

I will now tell you my idea about the stand of plants for an ideal maximum crop. As a rule in Vermont, if the soil was void of noxious weeds or tenacious grass roots, I would place them in drills from three feet to three feet six inches apart and two stalks to the foot in the drill, making the rows perfectly straight, enabling very thorough and close cultivation by machinery. Yet as a rule I would recommend check-planting upon most soils. All things considered the crop can be raised more cheaply, though not quite as large, in perfect squares three feet to three feet four inches apart each way, with three to four stalks in the hill, preferring three bearing stalks, although this varies somewhat with the soil and variety of the seed, etc. And here is a factor that is underestimated,

CORN FOR SEED.

I have said corn is flexible, can be moulded, fixed with desired characteristics as one wishes. While so easily influenced, I would endeavor by isolation, careful cultivation, and a removal of the barren stalks and one-eared stalks, to render *permanent* those characteristics necessary to raising twin or triplet ears, and from such stalks I would select seed, for the same law follows here that we adhere to in the propagation of the animal kingdom. "Like begets like." Constant, undeviating observance of these rules would achieve much. Mr. G. W. Bradley of Hampden, Conn., exhibited stalks of corn containing eight and nine ears. This was the "Tennessee" variety, exhibited at the National Congress at New Haven. This shows the possibilities in the development of this crop by properly assisting nature. I assure you, farmers, as I said in the outset, we

do not understand the capabilities of the soil we till or the plants we cultivate. That there is a great variety of corn commendable to cultivate I admit, yet, on the whole, I think the eight-rowed has the most friends. Select the seed with medium length of ear, large kernel, straight, tight rows, small cob, nearly as large at the tip as at the butt, growing small, leafy stalks.

NEXT IS THE PLANTING.

If by hand I prefer to mix the seed in lye soap and immediately roll in plaster, preparing it at intervals but shortly before putting into the ground. What thus adheres to the kernel serves as quite an auxiliary in timely fertilization. Still I prefer to plant with a machine, thinking it more sure to germinate, and likely to drop the kernels more evenly, leaving the corn in fresh soil below the surface so that the smoothing harrow can be used as soon as desired after planting, and be continued in use until corn is six inches high, accelerating the growth and rendering cultivation more easy. Again, if desired to use some active fertilizer in hill, there are planters that will faithfully do it in quantities as desired, and in a manner not to injure the germ of the seed. This method increases the growth and advances the time of maturity, and if the soil of the field has a ready, full supply of food requisite and in condition to perfectly continue the growth, a fine crop is assured. No doubt that the best fertilizer is barnyard manure of the best quality, as it holds the food in a slow yielding grasp, of a large vegetable quantity of matter, to resist drouth. Yet often it can be, as I have said, supplemented by aid of concentrated food during the early growth, that no stunt may be allowed to the crop. I again assert that constant stirring of the soil is fertilizing the crop, so I would run the best cultivator, horse-hoe, or any other machine by whatever name that does the most efficient work in place of the hand hoe, and continue to use it as long as the corn was not broken down by passing through it; not too deep or too near the hill, but keep all the weeds and grass eradicated, clean culture and tolerably level, though in "quack grass" localities there is no objection to covering the grass up around the hill, serving as a mulch, and my experience is that it is advantageous to the crop. A boy of fifteen can tend forty acres with one horse with the foot cultivator or sulky. Then comes the

CUTTING UP CORN.

Here comes another important era in this industry of corn raising by experience. I have learned, and am going to say to you, that I can raise corn for the fodder. As I am a producer of milk, I have learned that an acre of corn fodder is equal to a good fair acre of grass, and when I plow up such a piece of land I am not diminishing my hay crop; and yet it is just as necessary to cut it at the right time as it is my grass, and by so doing I have learned another fact —that the corn is better. As soon as the majority of the ears are specked or glazed, even if many are in the milk, seldom a husk turned white. I cut it as fast as possible, five rows into one of

stooks, in good corn, setting around every other hill uncut, making about fifteen hills in a stook, well set, equally, around and close up to the hill with an inclination just enough to give stability and firmness to its standing posture; then, with a good band of rye straw, turn well over the top and bind firmly. Be sure it is erect, giving the ends a certain twist and it will stay as long as desired, much longer than when the end is tucked under, and it binds much more closely. If the work is well done it will stand until winter; not one in a thousand will fall down. Put up in this way it resists the storms until harvested, is green, succulent, and readily eaten by all stock. In good weather, in about three weeks from the time of cutting, it will be ready for husking. If the sap is not dried out sufficient to pack the fodder in safety, alternate layers of straw or hay will prevent its moulding, after which pack in large bulk, evenly as you would hay, and there is no trouble in keeping. I find it equal, if not worth more, than the best hay in producing milk, and I have stated, and again state, that I kept ten two-year-old steers upon eleven acres of matured corn fodder nearly through the winter, and they were so well kept that they went the first of July following for beef; and it is the practice of the farmers upon the river to take to winter two-year-old steers, (the usual price being ten dollars a head) and keep them exclusively on corn fodder and straw. Some of them go for beef before turned out, the remainder for early beef. Now one of the reasons why I shall urge the farmers to increase their corn crop is for fodder, increasing the keeping capacity of their farms, and often enabling them to sell the best hay at a good price, feeding that unsalable corn fodder, really the best forage on the farm. The introduction of the silo and the soiling crop is fast showing the farmer the value of this corn plant. Then again the most potent consideration I urge in increasing the corn crop is to save this terrible outlay for Western corn, when the large majority of farmers in Vermont can raise it cheaper than they can buy it. We generated this habit of purchasing grain during the war, going to the mill and depot, often getting it charged, bag after bag, until a frightful bill made its appearance. Farms deteriorated, indebtedness rolled upon us, and we were reminded of the necessity of being a more self-sustaining people. We must buy less and sell more, and this is one of the important steps to be taken. When I interviewed Ex-Gov. Smith, who kindly requested his clerks to give me a summary of what Western corn they bring into the state, he stated it was about one-half of the whole quantity imported. This would give an aggregate of 2,182,642. Now we raise 2,014,271 bushels. Then if the 35,000 farms in Vermont would increase the productiveness of their farms in this one crop by raising sixty bushels more than now upon each farm, we would wipe out this outlay, besides increasing the forage crop for our stock, could keep more stock, making more manure, enriching our farms, and building up the strength of our agriculture. To this end I have urged the farmers to raise more corn, corn in all forms for maturity, soiling or silo, or all, as the farm presents proper facilities. With an increasing dry climate, with the future agricultural prosperity of Vermont hinged upon the cultiva-

tion of this plant, that as our pastures are sensibly failing in their productiveness, striking a vital blow against successful dairy husbandry, apparently the leading industry for the future, the cultivation of this plant to supplement the pasture is very important, and growing in favor each and every year; and then fodder corn for fall and winter feeding is highly prized, as so much can be raised upon the acre; then the raising of it for ensilage has been found to be a great discovery. No new system with such a wide departure from the old custom has been so universally approved when tested. These many methods in which corn can be raised to a profit ought to inspire the Vermont farmer to increase its cultivation, thereby adding to individual prosperity and to the whole state a financial revolution—one million two hundred seventy-nine thousand five hundred and eighty-five dollars annually ($1,279,585)—saying nothing of doubling the amount of our stover for stock food, all reserved to build up our noble state. Now, in conclusion, let me say we may prepare a nice seed bed, and introduce fine seed at the right time into the soil. It comes quickly, but

THE CROW.

As I treat him different from many, what I shall say may be an innovation upon the practice of the general farmer. In raising corn it is very essential to me that the crow accompany me; he is my friend, and I form a copartnership with him; nature and myself find the capital and he puts in work in offset. I say the farmers' friend, a friend to the agriculturist. I never disturb him to injure. Though he has his faults, yet his virtues far exceed his vices. His music does not strike the musical ear pleasantly, yet remember he is a scavenger, a glutton; don't forget his consumption of the grasshopper, the grub, the cut-worm, the potato bug, the decaying animals; please give him credit for all this. "Now," says the crow-hater, "what about pulling corn? If you wish to raise a maximum crop, do you wish to have one hill in ten pulled by the crow?" No; I have been for twenty-four years raising from fifteen to thirty acres annually, and, all told, I never had one-fourth of an acre pulled up by the crows. "Well," says the crow-hater, "how do you keep them off?" I don't do that; I invite them on to my field by sowing corn over the surface, four quarts to the acre, and when the cut-worms and grubs are not plenty enough they will take a little corn. Sow as soon as done planting; and you may take the poorest corn you have, even rat eaten from the bottom of the corn bin; he is not particular; all he wants is enough. Now, for the comfort of those who swear eternal vengeance on my friend *crow*, erecting all the scarecrows imaginable from twine, wind-mills and hoop-skirts, even hunting their young Sundays, let them try one more remedy. I will relate an incident which it is said occurred in Cattaraugus county, N. Y., of a man who found his ideal image of the most hideous person he could imagine and proceeded to construct it. When completed he started to the field, as a last resort to keep the "pesky" crows out of his field, and the crows began to make an unusual noise, and in a few days they returned the corn they pulled that year and part they pulled the year before.